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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| Application No.: | 09/754,823 |
| Filing Date: | January 4, 2001 |
| Applicant: | ARAI et al |
| Group Art Unit: | 1742 |
| Examiner: | SHEEHAN, J |
| Title: | MAGNETIC POWDER AND ISOTROPIC BONDED MAGNET |
| Attorney Docket: | 9319A-000182 |

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Director of The United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

**Affidavit Of Akira ARAI Traversing Rejection Under 37 C.F.R. 1.132**

Sir:

I, Akira ARAI, state as follows:

1. I graduated from Tokyo University in 1989 with a master degree in chemical.

2. In 1989, I started working for Seiko Epson corporation as a chemical engineer in the R & D department.

3. I am an inventor of the subject matter claimed in the above-identified patent application.

4. Presently, most high performance rare-earth bonded magnets are isotropic bonded magnets which are made using MQP-B powder manufactured by MQI Inc. These isotropic bonded magnets are superior to anisotropic bonded magnets because the manufacturing process can be simplified in that no magnetic field orientation is required. Notwithstanding, isotropic bonded magnets manufactured using the MQP-B powder involve various deficiencies.

5. More specifically, isotropic bonded magnets using the MQP-B powder do not have a sufficiently high magnetic flux density. Further, because the magnetic powder has poor magnetization, the content of the magnetic powder to be used in the bonded magnet has to be increased. An increase in the content of the magnetic powder, however, leads to the deterioration in the moldability of the bonded magnet. Moreover, even if the content of the magnetic powder is somehow managed to be increased by changing the molding conditions or the like, there still exists a limit to the magnetic flux density that can be obtained. For these reasons, when the bonded magnet is used in a motor, it is not possible to reduce the size of the motor by using the conventional isotropic bonded magnet.

6. Still further, although there are reports concerning nanocomposite magnets that have high remanent magnetic flux densities, their coercive forces, on the contrary, are so small that the magnetic flux densities that may be obtained when the magnets are used in motors are very low. Moreover, these small coercive forces result in poor heat stability.

7. Lastly, bonded magnets produced using the MQP-B powder have low corrosion resistance and heat resistance. This is because it is necessary to increase the

content of the magnetic powder in the bonded magnet in order to compensate the low magnetic properties (magnetic performance) of the magnetic powder. As a result, the density of the bonded magnet becomes extremely high, which further results in the corrosion resistance and heat resistance of the bonded magnet being deteriorated. As such, the magnets will have a low reliability.

8. As part of the inventive process, we determined that a magnetic powder having a particle size in the range of 0.5 – 80 μm had particular advantages over the above conventional powder produced by MQI Inc.

9. A particle size in the range of 0.5 – 80 μm enables the filling rate of the magnetic powder to be increased in a bonded magnet.

10. When the magnetic powder including the claimed particle size of 0.5 – 80 μm is kneaded with a resin, the resin easily adheres to the circumference of each particle. This results in improved heat resistance and corrosion resistance.

11. When the magnetic powder including the claimed particle size of 0.5 – 80 μm is mixed with a thermoplastic resin and warm molded, the fluidity of the kneaded material is improved, which results in improved moldability.

12. In contrast to the forgoing advantages, a particle size of 200 μm (such as that preferred by Panchanathan, U.S. Pat. No. 5,725,792, at column 2, lines 15-16, assigned to MQI Inc.) does not enable an increased filling rate of the magnetic powder in a bonded magnet, does not allow a resin to easily adhere to a circumference of the particle to increase heat resistance and corrosion resistance, and does not improve the fluidity of a mixture of the magnetic powder and a thermoplastic resin to improve moldability.

13. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,

Date: 29 April, 2004

By: Akira Arai
Akira ARAI